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Title: IMPROVEMENTS TO A CUTTING ATTACHMENT.

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REPORT

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assembly being mounted in a flexible manner with respect to the chassis, so that it can follow ground irregularities.

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5 Nevertheless, this system is not suitable to mow a golf practice course, since it would itself cause damages to balls. In fact, retractable blades can come in contact with balls. Tests have been done by varying the cutting height, but balls remain a little suspended over the grass, as a function of the height and density
10 of the lawn. As a result, even when mowing at a height above the diameter of balls, the latter are damaged.

Therefore, there exists a definite need to develop a cutting attachment for mowing golf courses in the presence of golf balls, which is particularly adapted
15 to automatic mowing of practice courses with no human intervention, and possibly even allows players to continue their practice.

To this end, this invention suggests an improvement to a robotic lawn mower, e.g. the one
20 described in patent application no. PCT/BE98/00038, consisting of a cutting attachment which allows mowing in the presence of hard, small-sized objects, as compared to the cutting attachment, more particularly in the presence of golf balls, without damaging them.

25 According to the invention, the freely rotating disk or plate proposed in the above application is provided with extensions, or "prongs", which extend radially from its periphery so that balls or other equivalent objects may be maintained out of the reach
30 of the retractable blades, while allowing the latter to reach and cut the grass like in prior art. The system

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attachment for a mowing machine, particularly for a lawn mower, comprising a motor whereof the driving shaft is linked to a cutter disk perpendicular to said shaft and provided at its periphery with at least one blade, and a bottom plate substantially parallel to, and located beneath the cutter disk, characterized in that the bottom plate periphery has substantially coplanar extensions or prongs, extending radially beyond the zone reachable by the blades.

The bottom plate or disk is substantially circular and has a diameter, excluding the extensions, which is substantially equal to or smaller than the one of the cutter disk. By way of example, in the case of a robotic lawn mower, the cutter disk may have a smaller diameter ("excluding the prongs") of 22 cm and an "outside" diameter of 29 cm.

The bottom plate is mounted freely on the cutter disk pin via a roller bearing, e.g. a ball bearing, or the like.

Extensions are provided in the form of prongs having a rounded profile (hollows and tips). The distance between two tips or ends of adjacent extensions 33 ranges, for instance, from 2 cm to 5 cm. The number of extensions per bottom plate preferably ranges from 10 to 60, more preferably from 20 to 40.

The cutting attachment is preferably linked to the chassis via a suspension system.

The cutting attachment will be preferably suitable for a robotic lawn mower, particularly for mowing golf courses, more particularly for mowing practice courses.

The invention will be understood more clearly

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from the following description, with reference to one embodiment, and particularly to the drawings annexed by way of non-limiting examples.

Fig. 1 is a bottom view of the plate of a cutting attachment according to the invention.

Fig. 2 is a sectional side view of a cutting attachment mounted on a member of the chassis.

Figs. 3a through 3c show the operation of the cutting attachment in the presence of a ball according to prior art (Fig. 3a) and according to the invention (Figs. 3b-c).

In Fig. 1 the bottom circular plate 3, freely rotating about the cutting axis 6, is recognizable. The cutter disk 2 is situated above the plate 3, and is driven by the motor, parallel to the plate. The cutter disk has three blades 1 at its periphery, which extend radially and can pivot freely about an axis of rotation 4 and retract thereafter beneath the cutter disk under the effect of an excessive resistance. (The bottom plate 3 (freely rotating protective disk) is provided with regular, coplanar extensions 33 at its periphery in the form of rounded prongs extending beyond the zone that the extracted blades can reach by the centrifugal force due to the rotation of the cutter disk.) The distance between two radial ends of the extensions is smaller than the size of the objects, in this case of golf balls. Balls are kept out of the reach of the free blades between two adjacent extensions. When the grass is cut balls are not touched by the blades.

As the robotic lawn mower advances, the cutter disk will pass over the balls, partly by free rotation

thereof, partly by friction.

According to a variant, which is currently less preferred, the ends of the extensions may be upwardly curved.

5 Fig. 2 shows more particularly a cutting attachment which is mounted in a well-known suspended arrangement (suspension rod 7, spring (17) ^{not in drawing} on a member 8 of the chassis. The numeral 5 denotes the location of the ball bearing allowing free rotation of the protective plate 3, all other numerals being equally
10 provided in Fig. 1. It shall be noted that the extensions 33 of the plate 3 extend radially slightly beyond the extracted blades 1.

 Figs. 3a-b show the contact between the cutting
15 attachment and a spherical object, e.g. a golf ball. In Fig. 3a, the cutting attachment is a prior art cutting attachment. As the lawn mower advances, the ball 9 is damaged in 10 by the rotating blades 1, before passing under the "floating" cutting attachment, totally in
20 friction, particularly under the freely rotating plate 3.

 Figs. 3b and 3c show the contact between the cutting attachment of the invention and a golf ball. The extensions 33 of the plate 3 prevent the blades
25 from contacting the ball, which will advantageously pass beneath the freely rotating plate, while the cutting attachment is lifted. At the same time, the ball itself will generally sink to a certain extent into the grass, and will pass beneath the plate with a
30 minimized friction (Fig. 3c).

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